

Blast Disease of Rice

Scientific name: *Pyricularia grisea*, *Magnaporthe grisea*.

Causal organism: Fungus.

Occurrence

Blast disease of rice is a world wide and most important disease of rice. Particularly, It occurs in areas with low soil moisture, frequent and prolonged periods of rain shower, and cool temperature in the daytime. In upland rice, large day-night temperature differences that cause dew formation on leaves and overall cooler temperatures favor the development of the disease. Rice can have blast in all growth stages. However, leaf blast incidence tends to lessen as plants mature and develop adult plant resistance to the disease.

Symptoms

Leaf Symptoms: Lesions that occur on the leaf are usually diamond-shaped with a gray or white in center and brown or reddish brown border. Or Leaf blast lesions are usually elongated and pointed at each end, while brown spot lesions tend to be more round, brown in colour and have a yellow halo surrounding the lesion. Newly formed lesions may have a white or grey-green center and a darker green border. Leaf blast may sometimes cause the complete death of young plants up to the tillering stage. Leaves of susceptible varieties may be killed.

Leaf Collar Symptoms: Infection at the junction of the leaf blade and sheath results in the typical brown "collar rot" symptom. A severe collar infection may cause the leaf to die completely.

Node Symptoms: Stem nodes may be attacked as the plant approaches maturity, causing the complete death of the stem above the infection. Diseased nodes are brown or black.

Panicle and Grain Symptoms: Lesions may also occur on panicle neck. Infections just below the panicle, usually at the neck node, cause a "neck rot" or "rotten neck blast" symptom that can be very injurious to the crop. If neck rot occurs early, the entire panicle may die prematurely, leaving it white and completely blank. Later infections may cause incomplete grain filling and poor milling quality. Other parts of the panicle including panicle branches and glumes may also be infected. Panicle lesions are usually brown, but sometimes the infected necks turn blackish and break

over. Neck blast results in few or no seeds in the panicle.

Recurrence of the pathogen:

The pathogen over season at mycelium and conidia on diseased rice straw and seed. The matured conidia become air borne and landing on rice plant. The conidia adhere through sticky mucilage.

Conditions that favour development

- i) Infested or diseased seeds.
- ii) Excessive use of nitrogen.
- iii) Poor air flow and poor sunlight penetration.
- iv) Rainy days with high humidity.

Prevention and control

- i) Use diseased-free seeds and early planting.
- ii) Use resistant cultivars.
- iii) Proper plant spacing, transplanting is advisable rather than broadcasting.
- iv) Split applications of nitrogenous fertilizer.
- v) Apply compost.
- vi) Avoid farm activities when plants are wet.
- vii) Burn diseased-straw and stubble.
- viii) Malabar nut extract.
- ix) Systemic fungicides like triazoles and strobilurins can be used judiciously for control to control blast. A fungicide application at heading can be effective in controlling the disease.

Stem rot of rice

Causal Organism : *Sclerotium oryzae*.

Distribution

The disease has been reported from all rice growing countries such as Japan, China, Philippines, Sri-lanka, Brazil, Italy etc. Sclerotial stage of stem rot rice was first

described by cattaneo from Italy in 1876. In India the disease was first reported by Bengal, 1911.

Symptoms

The disease commonly found in transplanted rice in the month of July-September.

1. First of all, small dark lesions are developed on the outer leaf sheath at the water line. Later on this lesion gradually makes its appearance on the inner leaf sheath and the culm.
2. The affected and numerous small dark brown Sclerotia are formed in the tissues of the leaf sheath. In later stage, the mycelial mats and the Sclerotia are copiously formed in the culm also.
3. Rotting remains restricted to a few lower inter-nodes. As the plants matured the intensity of infection is increased.
4. The culms collapse and plants lodge heavily, when the infection attacks late in the growing season, the grains are much shrivelled.

Nature and Recurrence of disease

The Sclerotia float on water and spread from fields to fields or plants to plants. The Sclerotia are responsible for primary infection. Where as, when the conidia are produced, they are also spread through the irrigation water and secondary infection may be caused.

Favourable condition

- Excessive flooding.
- Excess use of nitrogenous fertilizer.
- Early and late varieties.
- Excess use of phosphatic fertilizer.

Control Measure

- a. The best method of disease control is to cultivate resistance varieties.
- b. Wide spacing should be provided.
- c. Crop rotation and field cultivation should be practiced.
- d. Proper manuring and balanced fertilizer.

e. Spraying with Cupravit @ 0.4% and Topsin @ 0.2% when disease appear.

Bacterial Leaf Blight of Rice (BLB)

The most common bacterial leaf blight of rice caused by *Xanthomonas oryzae*.

BLB probably world wide in distribution.

Symptoms

They symptoms appear on leaf blade and sheath as small linear, water soaked areas that soon elongate and coalesce into irregular, narrow, yellowish or brownish stripes.

Severe infection cause leaves to turn yellow and die from the tip downwards ; the also retard spike elongation and cause blighting.

Small lesions form on the spike as well. The disease develop mainly in rainy, damp weather. The bacteria over wintering on the seed and crop residues and are spread by rain, direct contact and insect.

Control Measure

The main control measure are use of disease free or treated and crop rotation.

- i) Seed treatment with agrimycin @ 0.025% for 12 hours before sowing.
- ii) In infected field spray with K fertilizer @ 50-100 g/L water at evening.
- iii) Avoiding susceptible variety for cultivation.
- iv) Crop residues should be burnt after harvesting.

Tungro Disease of Rice

Tungro virus

Tungro is the most serious viral disease of rice is south and south east asia from Pakistan to the Philippines.

Virus and Vector

Tungro is the result of concurrent infection by two viruses, the single stranded RNA virus/rice tungro Spherical Waika virus (RTSV) and the Double standard RNA virus, Rice Tungro Baciliform Badnavirus (RTBV). Both viruses are transmitted by

Several leaf hoppers, particularly *Nephotettix virescens* (GLH) in the semi-persistent manner.

Symptoms

- Tungro infected rice plants are stunted and show mottling and yellow orange discolouration of the leaves.
- The typical tungro symptoms can be caused by RTBV, but they are intensified by the presence of RTSV.
- RTSV often occurs along with but causes only very mild symptoms. The disease caused by RTSV alone was earlier known as rice waika and the virus was rice waika virus.
- Infection generally starts from seedlings stage. Green leaf hoppers are seen in the field, infected plant roots are weak and pulled up the plant by hand easily comes out.

Control Measures

Control of tungro disease depends on the use of vector resistant or virus resistance varieties. Tungro disease is usually endemic in irrigated areas, where rice is planted round the year.

- **Cultural Practices-** Planting time, crop density, sanitation and roughing, fertilizer management, seed protection, crop rotation, synchronous planting and crop free period.
- **Chemical Control-** Insecticides for the control of spraying GLH e.g. Diazinon 57 EC @15 ml/L at 7-10 days intervals for 2-3 times to protect the vectors.
- **Use of resistant varieties-** BR 10, 11, 14, 16, 20, 22, BRRI dhan 27, 36, 39, 41 etc.
- **Destruction of alternate hosts-** Durba, syama, arial.

Foot rot of Rice or Bakani disease

Causal Organism : *Fusarium moniliforme*.

Distribution

The foot rot of rice was first recorded from Italy in 1877. From Japan, the disease was first described in 1898 and was known as Bakani disease. The pathogen is world wide distribution.

Symptoms

1. The disease affects the host mainly in the seedlings stage and symptoms are clearly seen in the nursery. Sometimes grains fail to germinate or the seedlings fail to emerge above the soil.
2. The most conspicuous and detectable symptoms of the diseases appear in the seedlings. The affected seedlings become thin, pale and tall, such symptoms appear from the 6th days after sowing in wet nurseries and continue upto 6 weeks.
3. As soon as the symptoms appear the seedlings wilt and die within 3-6 days.
4. Mainly this is a nursery disease but may occur throughout the life of the crops. In severe infection either the panicle doesn't develop or a whitish sterile ear is develop.

Natural Recurrence of Disease

Generally the disease is externally seed borne, there are evidence to show them the disease may sometimes soil borne. The infected stubbles and plant debris may left in the field after harvest cause infection through the soil.

Favourable Condition

1. Soil temperature and moisture influence the intensity of the disease.
2. Optimum temperature for the survival of pathogen lies between 25-30⁰ C.
3. Excess use of nitrogenous fertilizer increase intensity of disease.

Control Measures

Since the disease is seed, soil borne, various methods of seed/soil treatment have been suggested for the control of this disease.

Grain/seed are steeped in 1% formaline for 15 minutes.

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Black/Stem rust/Rust of wheat

Causal organism : *Puccinia graminis tritici*.

Symptoms

Black rust is first marked by an eruption of elongated brown pustules on the stalk, leaf sheath and leaves. These pustules may be quarter of an inch or more in length and frequently run into one another. Later on teliosorus developed. The teliospores or teliospores are often produced in the same sorus as the urediniospores and they are darker in colour, one can see the pustules gradually changing from brown to black as the season advances.

Recurrence of the Pathogen

The pathogen are ear borne. The pathogen pass their life cycle on two different host wheat and barberry, which are abundantly found in hilly region. The summer heat in the plains that follows the wheat harvest kills on the urediniospores of rust.

Control Measures

1. Through yield cultivation, proper manuring and balance fertilizer.
2. Seed treatment vitavax 200 @ 3 gm/kg or Bavistin @ 2 gm/kg seed.
3. Spraying with tilt 250 EC @ 1 ml/L of water or calyxin @ 0.5 ml/L of water.
4. Cultivate resistant varieties.

Powdery Mildew of Wheat

Causal Organism: *Erysiphe graminis*.

Distribution

The powdery mildew of wheat is commonly found in those region where there is enough moisture during sowing time. This disease has not or little importance in the plains of India and Bangladesh. This disease is commonly found in the lower hill tracts of Northern India.

Symptoms

The pathogen is an obligate parasite and usually found on leaves, young shoot, inflorescence and other tissues of host plant.

1. The fungus may appear in an isolated white patch in the beginning, which may coalesce with other patch and form big one's on the leaves. Sometimes hole of the leaves is found to the affected.
2. The mycelium on the host is entirely superficial, forming a flocculent matted growth,.At first white when the conidia being formed,there after changing into a grey or Reddish brown in colour when cleistothecia are developed.
3. In severe cases, the leaves become crinkled, twisted or variously formed.The top of the shoots drops down and wither and ear developed is checked to some extend.
4. Later on,usually at earing time small dot like,spherical cleistothecia are formed in the superficial mycelia.
5. From much discolouration and coverage of host epidermis by fungus,photosynthesis is less and there is much chlorosis which makes the plant weak.
6. The development of infected ear is arrested and the ear wither.If the disease incident takes place at the milk stage,the grain are dried and shrivelled.

Natural Recurrence of Disease

The recurrence of disease takes place cleistothecia. The cleistothecia remain on the straw and plant debris.After harvest and provide the necessary inoculum for the next season. The primary infection is brought by ascospore and the secondary infection is formed by air borne conidia.

Control Measures

- The best method of control is to sow the resistant varieties in foreign countries like USA,Canada much work has been done to evolved the resistant varieties.
- Sulphur dusting @2-3 kg/ha at 2-3 times in 12 days intervals has been proved to be fruitful in the control of this disease.
- Spraying with calyxin@ 0.4 L/ha.

Loose Smut of Wheat

Occurrence

Loose smut is a serious disease of wheat and is responsible for heavy losses,when susceptible varieties with infected seeds are grown year after year.It occurs world wide but more abundant and serious in humid and sub-humid regions.Loose smut causes

damage by destroying the kernels of the infected plant and by smearing and thus reducing the quality of the grain of the infected plants on harvest. Losses from it may be up to 10-40% in certain localities in a year.

Symptoms

1. The destructive nature of the disease lies in the fact that every head of the affected plants may be converted into a black mass of spores and number of grains are formed.
2. In an infected plant, usually all the heads and all the spikelets and kernels of each head are smutted, that is they are each transformed into a smut mass containing olive green spores.
3. Smutted kernels are at first covered by a delicate greyish membrane which soon bursts and sets the powdery spores free. The spores are then blown off by the wind and leave the rachis a naked stalk.

Pathogen and development of Disease

Causal organism : *Ustilago nuda*.

The mycelium is hyaline during its growth through the plant and it is hyaline changing to brown near maturity. The mycelial cells are transformed into brown, spherical, teliospore which germinate readily and produce a basidium consisting of 1-4 cells.

The pathogen overwinters as dormant mycelium in the cotyledon of infected kernels when planted infected kernels begin to germinate and the mycelium resumes its activity and grows intercellularly through the tissues of the young seedlings until it reaches the growing point of the plant.

When the plant forms the head, the mycelium invades all the young spikelets, where it grows intercellularly and destroys most of the tissues of the spikelets.

The mycelium in the infected kernels soon transforms into teliospore, which are contained by a delicate membrane, after maturation the membrane bursts and the teliospore is blown off by air current and spread to the healthy plant.

Control Measures

- Loose smut is now controlled by treating infected seeds with carboxin and its carboxanilide derivatives before sowing.
- Use resistant varieties.
- The best means of controlling loose smut is through the use of certified smut free

seed.

- Treating seed with hot water, half filled barlap bag.
 - i. 20⁰C water for 5 hours.
 - ii. After 1 minute 49⁰ C for 1 minute.
 - iii. Then in 52⁰ C water for exactly 11 minutes and immediately placing it cold water for the seeds cool off.

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